

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

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|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|
| Applicant's or agent's file reference AM 1889 - PGR/db | FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416) | |
| International application No. PCT/FR2003/002790 | International filing date (day/month/year) 23 septembre 2003 (23.09.2003) | Priority date (day/month/year) 25 septembre 2002 (25.09.2002) |
| International Patent Classification (IPC) or national classification and IPC B01J 27/182, 27/186, 23/30, 21/18, C07C 319/04, C07B 45/06, C07C 319/06, 321/04 | | |
| Applicant ARKEMA | | |

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|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of <u>5</u> sheets, including this cover sheet.</p> <p><input type="checkbox"/> This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).</p> <p>These annexes consist of a total of _____ sheets.</p> |
| <p>3. This report contains indications relating to the following items:</p> <ul style="list-style-type: none"> I <input checked="" type="checkbox"/> Basis of the report II <input type="checkbox"/> Priority III <input type="checkbox"/> Non-establishment of opinion with regard to novelty, inventive step and industrial applicability IV <input type="checkbox"/> Lack of unity of invention V <input checked="" type="checkbox"/> Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement VI <input type="checkbox"/> Certain documents cited VII <input type="checkbox"/> Certain defects in the international application VIII <input type="checkbox"/> Certain observations on the international application |

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|-----------------------------------------------------------------------|---------------------------------------------------------------------------|
| Date of submission of the demand 07 avril 2004 (07.04.2004) | Date of completion of this report 11 November 2004 (11.11.2004) |
| Name and mailing address of the IPEA/EP | Authorized officer |
| Facsimile No. | Telephone No. |

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/FR2003/002790

I. Basis of the report

1. With regard to the elements of the international application:*

the international application as originally filed
 the description:

pages _____ 1-9 _____, as originally filed
 pages _____ _____, filed with the demand
 pages _____ _____, filed with the letter of _____

the claims:

pages _____ 1-14 _____, as originally filed
 pages _____ _____, as amended (together with any statement under Article 19
 pages _____ _____, filed with the demand
 pages _____ _____, filed with the letter of _____

the drawings:

pages _____ _____, as originally filed
 pages _____ _____, filed with the demand
 pages _____ _____, filed with the letter of _____

the sequence listing part of the description:

pages _____ _____, as originally filed
 pages _____ _____, filed with the demand
 pages _____ _____, filed with the letter of _____

2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item. These elements were available or furnished to this Authority in the following language _____ which is:

the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).
 the language of publication of the international application (under Rule 48.3(b)).
 the language of the translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

contained in the international application in written form.
 filed together with the international application in computer readable form.
 furnished subsequently to this Authority in written form.
 furnished subsequently to this Authority in computer readable form.
 The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
 The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

the description, pages _____
 the claims, Nos. _____
 the drawings, sheets/fig _____

5. This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).**

* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rule 70.16 and 70.17).

** Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.
PCT/FR 03/02790

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

| | | | |
|-------------------------------|--------|------|-----|
| Novelty (N) | Claims | 1-14 | YES |
| | Claims | | NO |
| Inventive step (IS) | Claims | 1-14 | YES |
| | Claims | | NO |
| Industrial applicability (IA) | Claims | 1-14 | YES |
| | Claims | | NO |

2. Citations and explanations

This report makes reference to the following document:

D1: US 4 059 636 A (D.H. Kubicek), 22 November 1977

1. Subject matter

The present application relates to a process for preparing a mercaptan from a thioether and hydrogen sulphide in the presence of hydrogen and a catalytic composition comprising a strong acid (preferably 12-phosphotungstic acid, claim 7) and a metal of group VIII of the periodic table (preferably palladium, claim 10).

2. Novelty

Document D1 describes (example II) a process for preparing butyl mercaptan from dibutyl sulphide and hydrogen sulphide in the presence of a catalyst containing phosphotungstic acid impregnated into alumina. That process does not use hydrogen or a group VIII metal. Document D1 does not describe the process as per claim 1 of the present application. Consequently, the present application meets the requirements of PCT Article 33(2) because the subject matter of claims 1-14 is novel.

3. Inventive step

Document D1 is considered to constitute the prior art closest to the subject matter of claim 1 and describes (example II) a process for preparing butyl mercaptan from dibutyl sulphide and hydrogen sulphide in the presence of a catalyst containing phosphotungstic acid impregnated into alumina. That process does not use hydrogen or a group VIII metal.

In the process according to the present invention, the conversion rate of diethylsulphide to ethyl mercaptan amounts to 52% (example 2). In the process described in example II of document D1, the conversion rate of dibutyl sulphide to butyl mercaptan amounts to only 8.1% (table I) at a temperature of 232°C and under a pressure ranging from 31 to 34.5 bar (450-500 psig).

The present invention can therefore be considered to address the problem of devising an improved process for preparing mercaptans from thioethers. The applicant uses the process as per claim 1 to solve this problem.

There is no indication in D1 or in the remaining prior art that the use of hydrogen and of a group VIII metal to convert a thioether to a mercaptan would lead to a distinctly higher conversion rate. The solution proposed in claim 1 of the present application is therefore considered inventive (PCT Article 33(3)).